

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
29 November 2001 (29.11.2001)

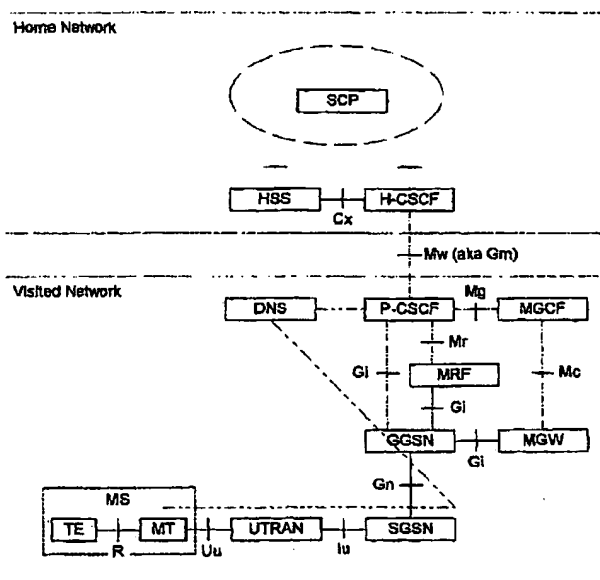
PCT

(10) International Publication Number
WO 01/91419 A1

- (51) International Patent Classification⁷: **H04L 29/12**,
29/06, 12/28 A-1100 Wien (AT). **MEMAR, Mohammad, Ali** [AT/AT];
Gallmeyergasse 18/4/42, A-1190 Wien (AT).
- (21) International Application Number: **PCT/EP01/05682** (74) Common Representative: **SIEMENS AKTIENGESELLSCHAFT**; Postfach 22 16 34, 80506 München (DE).
- (22) International Filing Date: 17 May 2001 (17.05.2001)
- (25) Filing Language: English (81) Designated States (national): CA, US.
- (26) Publication Language: English (84) Designated States (regional): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR).
- (30) Priority Data:
00110837.2 22 May 2000 (22.05.2000) EP Published:
— with international search report
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments
— entirely in electronic form (except for this front page) and available upon request from the International Bureau
- (71) Applicant (for all designated States except US):
SIEMENS AKTIENGESELLSCHAFT [DE/DE];
Wittelsbacherplatz 2, 80333 München (DE).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **BOESZOER-MENYI, Adam** [HU/AT]; Römerstr. 1, A-2424 Zurndorf (AT). **JANKO, Otto** [AT/AT]; Leinnizgasse 35/18,

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD FOR ADDRESS RESOLUTION TO FIND CALL CONTROL FUNCTION INSTANCES



(57) Abstract: A mobile station can be provided with necessary information of call state control functions, especially in case of roaming without expenditure when using a proxy call state control function (P-CSCF) acting as a border element and controlling local services and occasionally necessary resources within this network. According to a preferred embodiment the selected call state control function (CSCF) acts as a redirect server and redirects a session initiation protocol (SIP) request to another, especially an (CSCF).

BEST AVAILABLE COPY

Description:

Method for address resolution to find call control function instances

5

Present invention relates to an address resolution procedure to find various CSCF instances in an IP controlled network according to pre-characterising part of claim 1.

- 10 For Universal Mobile Telecommunication System (UMTS) there is known a routing model introduced in Third Generation Partnership Project (3GPP) Standard "TS 23.228". In each network exists a Proxy Call State Control Function (P-CSCF) which is the first contact point within the IM CN (IP Multimedia Core
- 15 Network) subsystem.

- When a mobile station or mobile host visits a foreign network then IP-Address (IP: Internet-Protocol), Standard-Gateway and Domain Name Server (DNS) are assigned at bearer level. Their
- 20 values are taken from the address space of the visited network and assigned during Packet Data Protocol (PDP) context activation using Dynamic Host Configuration Protocol (DHCP), for example. All IP addresses are globally visible i.e. IP addresses are not taken from a private address space.

25

The object of the invention is to provide a mobile station with necessary information of call state control functions, in both cases, located at home and while roaming.

- 30 This object is solved by a method comprising features of claim 1 and a system comprising features of claim 7. Preferred embodiments are subject of depending claims.

According to a preferred embodiment the address resolution is based on domain name server information exclusively, therefore no other protocols or instances have to be introduced.

- 5 All Call State Control Function (CSCF) instances can be found using similar procedures. The solution requires no changes in the underlying 2nd Generation Access network, especially GSM/UMTS/GPRS network.
- 10 The Cx interface connecting Home Subscriber Server (HSS) and home call state control function must not be used across network boundaries. Preferably, the home call state control function is the contact point within an operator's network for all connections destined to a subscriber of that network
- 15 operator, or a roaming subscriber currently located within that network operator's service area.

There is not required a fixed assignment between mobile station or mobile host as visiting station and H-CSCF, although

20 a fixed assignment would be possible and would speed up address resolution.

There exist flexibility in CSCF selection by using Session Initiation Protocol (SIP) redirects conducted either by the

25 selected CSCF or optionally a dedicated redirect server e.g. load sharing.

A preferred embodiment is described in the following referring to enclosed drawing.

30

Fig. 1 discloses a communication system providing full home control and a proxy CSCF in the visited network first showing a plurality of devices known as such.

- 5 Fig. 2 shows a flow chart regarding attach, registration and address resolution procedures in such a visited network.

In present embodiment the local domain name server DNS of the
10 Visited Network is used to find the call state control function CSCF responsible for the call control, i.e. the proxy CSCF (P-CSCF). As can be gathered from Fig. 2 the mobile station (MS) asks the domain name server DNS for a P-CSCF address in one of the first steps, when asking for a call state
15 control function CSCF service. The domain name server DNS returns the addresses of possible proxy call state control function P-CSCF instance. The mobile station MS sends an information like „sip:register“ to this proxy call state control function P-CSCF.

20

There are at least four cases where the home call state control function H-CSCF discovery is executed to find the home call state control function H-CSCF of an mobile station MS as follows.

25

If the mobile station MS is attached in the home network, the (proxy) call state function P-CSCF assigned to mobile station MS during PDP Context activation Procedure (PDP: Packet Data Protocol) has to find out it's own home call state control
30 function H-CSCF.

If the mobile station MS is roaming in a visited 3rd Generation network like UMTS, the proxy call state control function P-CSCF assigned to mobile station MS during PDP Context acti-

vation Procedure has to find out the home call state control function H-CSCF of the calling mobile station MS.

- If the mobile station MS is roaming in a visited 3rd Generation network like UMTS, the proxy call state control function P-CSCF assigned to mobile station MS during PDP Context activation Procedure has to find out it's own home call state control function H-CSCF.
- 10 During call control (e.g. "sip:invite"), the home call state control function H-CSCF of the calling party has to find out the address of the device providing home call state control function H-CSCF of the called party.
- 15 To build up a connection with an ordered service at first the MSISDN of the mobile station MS is translated to a domain name e.g. "subscriber.hlr.network.country.xcscf". Thereafter the domain name server DNS is queried and returns the corresponding IP address if found or an error if not found. The
- 20 letter "x" of ..."xcscf" has different value for different roles of CSCF's.

- If the first domain name server query was not successful, domain name server DNS is queried again using
- 25 "hlr.network.country.xcscf", i.e. without subscriber data.

- If the second domain name server query was not successful, domain name server DNS is queried again using "network.country.xcscf", i.e. without subscriber and home location register data. This query must be successful. Otherwise
- 30 no services can be provided in the home network.

After the IP address is found session initiation protocol (SIP) messages are forwarded to the returned IP address (e.g. "sip:register" or "sip:invite"). In the case that no address could be found, the DNS generates an error message.

5

- According to a special embodiment any call state control function CSCF which is selected with domain name server queries can redirect a session initiation protocol (SIP) request to another call state control function CSCF if necessary, for example for load balancing or to optimise the signalling path or whatever. Even more sophisticated, domain name server DNS can return the address of a dedicated session initiation protocol (SIP) redirect server. The proxy call state control server P-CSCF can act as SIP redirect server. This optional new network entity does not process session initiation protocol messages by itself, but redirects them to an appropriate call state control function CSCF. The redirect server makes its decision based on information private to the operator.
- 20 If there is a fixed assignment between the mobile station MS and the home call state control function H-CSCF known by the mobile station MS, e.g. the address of the home call state control function H-CSCF can be stored in a SIM card of the mobile station MS, then the discovery of the home call state control function H-CSCF of the calling party as described above can be dropped.

- If the mobile station MS is roaming, it can hand over the address of it's own home call state control function H-CSCF to the proxy call state control function P-CSCF, e.g. in the "sip:register request" via a "route" parameter.

IP addresses can be taken from a public or local address space. When using a local address space additionally network address translation can be necessary.

- 5 Proxy or home call state control functions acts as call control instances in general which can be found via the domain name server or another device returning their addresses.

Patent claims:

1. Method for address resolution to find call state control
5 function instances in an internet protocol (IP) based network.
c.h a r a c t e r i s e d in that
a queried domain name server (DNS) returns an IP address cor-
responding to a requested call control instance address.
- 10 2. Method according to claim 1, wherein
the call control instance acts as call state control function
(CSCF).
3. Method according to claim 2, wherein
15 the call state control function (P-CSCF) acts as a border
element and controls local services and occasionally neces-
sary resources within a contacted network.
4. Method according to claim 2 or 3, wherein
20 the selected call state control function (CSCF) acts as a re-
direct server and redirects a session initiation protocol re-
quest to another call state control function (CSCF).
5. Method according to any preceding claim, wherein
25 the call control instance acts as first contact point within
a core network subsystem.
6. Method according to any preceding claim, wherein
an identification number (MSISDN) of a calling station (MS)
30 is translated to a domain name.
7. System for executing a method according to any preceding
claim,

said system being a wireless telecommunications network, especially an UMTS, or a wireless local area data network, especially a HiperLAN, having a domain name server (DNS) and a call control instance, said domain name server (DNS) returning an IP address to a requested call control instance address after an corresponding query of a connecting station (MS) ..

1/2

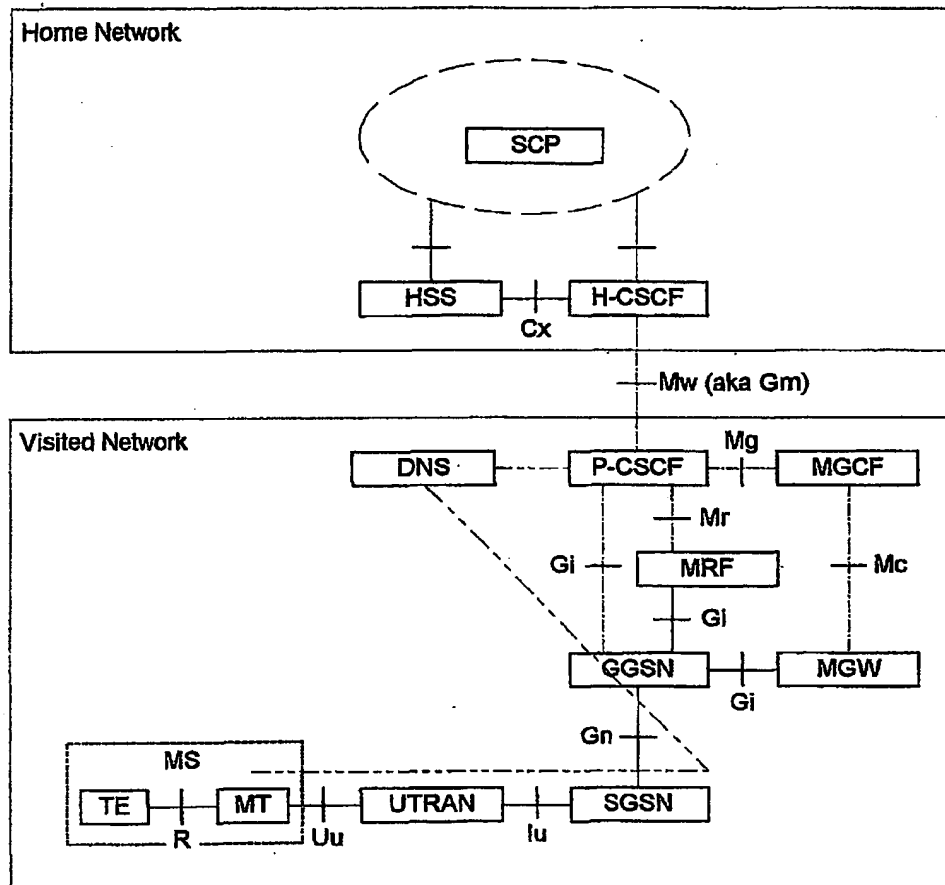


Fig. 1

2/2

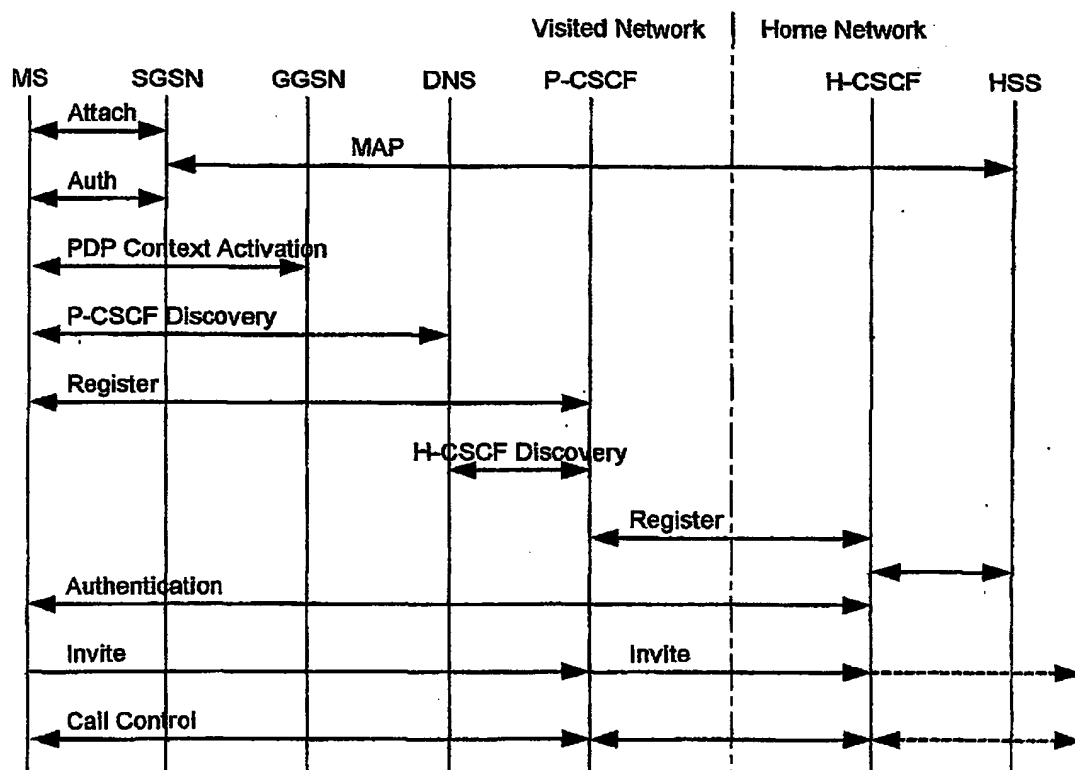


Fig. 2

INTERNATIONAL SEARCH REPORT

Intel ☐ International Application No

PCT/EP 01/05682

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04L29/12 H04L29/06 H04L12/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|---|-----------------------|
| Y | NAPOLITANO-RICAGNI: "UMTS all-IP Mobility Management, Call and session control Procedure" INTERNET-DRAFT, 'Online! XP002149519 internet-Draft Retrieved from the Internet: <URL:http://195.103.28.224/ricagni/draft-r icagni-megaco-umts-all-ip-00.pdf> 'retrieved on 2000-10-02! | 1,2 |
| A | page 3, line 7 - line 21 page 4, line 5 - line 30 page 9, line 11 - line 16 page 10, line 9 - line 15 page 12, line 7 - line 16 page 17, line 16 - line 24 page 19, line 1 -page 20, line 5 figures 1,4 -- -/- | 3-7 |

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

- 'A' document defining the general state of the art which is not considered to be of particular relevance
- 'E' earlier document but published on or after the international filing date
- 'L' document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- 'O' document referring to an oral disclosure, use, exhibition or other means
- 'P' document published prior to the international filing date but later than the priority date claimed

- 'T' later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- 'X' document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- 'Y' document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- 'Z' document member of the same patent family

Date of the actual completion of the international search

5 October 2001

Date of mailing of the international search report

12/10/2001

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Lai, C

INTERNATIONAL SEARCH REPORT

Int'l Application No

PCT/EP 01/05682

G.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|---|-----------------------|
| Y | EP 0 881 812 A (OKI ELECTRIC IND. CO LTD) 2 December 1998 (1998-12-02) abstract column 2, line 14 - line 29 column 5, line 19 - line 28 column 7, line 23 - column 8, line 9 figure 6 --- | 1,2 |
| A | WO 99 38303 A (NORTHERN TELECOM LTD ; SMITH JEFFREY G (US); BROTHERS JOHN DAVID WE) 29 July 1999 (1999-07-29) page 2, line 15 - page 3, line 19 page 5, line 1 - line 17 page 9, line 30 - page 10, line 4 --- | 1-7 |
| A | ANQUETIL L -P ET AL: "MEDIA GATEWAY CONTROL PROTOCOL AND VOICE OVER IP GATEWAYS. MGCP AND VOIP GATEWAYS WILL OFFER SEAMLESS INTERWORKING OF NEW VOIP NETWORKS WITH TODAY'S TELEPHONE NETWORKS" ELECTRICAL COMMUNICATION, ALCATEL. BRUSSELS, BE, 1 April 1999 (1999-04-01), pages 151-157, XP000830045 ISSN: 0013-4252 page 153, left-hand column, line 7 - page 154, middle column, line 37 --- | 1-7 |
| A | WO 99 11042 A (KONINKL PHILIPS ELECTRONICS NV ; PHILIPS SVENSKA AB (SE)) 4 March 1999 (1999-03-04) abstract page 1, line 12 - line 22 --- | 7 |

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 01/05682

| Patent document cited in search report | | Publication date | | Patent family member(s) | Publication date |
|---|---|---------------------|----|----------------------------|---------------------|
| EP 0881812 | A | 02-12-1998 | JP | 10327195 A | 08-12-1998 |
| | | | CA | 2238514 A1 | 26-11-1998 |
| | | | CN | 1200610 A | 02-12-1998 |
| | | | EP | 0881812 A2 | 02-12-1998 |
| | | | SG | 65071 A1 | 25-05-1999 |
| WO 9938303 | A | 29-07-1999 | AU | 2461299 A | 09-08-1999 |
| | | | EP | 1050146 A1 | 08-11-2000 |
| | | | WO | 9938303 A1 | 29-07-1999 |
| WO 9911042 | A | 04-03-1999 | EP | 0940026 A1 | 08-09-1999 |
| | | | WO | 9911042 A1 | 04-03-1999 |
| | | | JP | 2001505751 T | 24-04-2001 |
| | | | US | 6178512 B1 | 23-01-2001 |

Form PCT/ISA/210 (patent family annex) (July 1992)

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.